



## Understanding the pressure on agriculture land as a safeguard for food security in Malaysia

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### ABSTRACT

The utmost and continuing challenge facing the agriculture world is to produce enough food to feed the growing world population. Food security is inextricably linked to a community's access to land. Without land, there is no opportunity to improve agricultural practices, produce enough food and generate incomes. What worries more is that at present our country has to rely on the supply of imported food. Providing there are no crises or disasters in the Asia region then we can rest assured of the supply. That is the reason why the pressure put on agricultural land should be the main concern of all responsible parties, as it is the heart of our national domestic food production. Eventually, securing for food security is the only one dimension in protecting agricultural land. Agricultural land or sometimes referred to as 'rural amenities' is important as it provides scenic, wildlife, recreation and open space that gives benefits to society. Thus, this paper endeavors to comprehend the state of food security by analyzing the factors that lead to the pressure put on the agriculture land particularly in relation to the agricultural land revolution.

## 1. Introduction

The demand for food is expected to grow substantially by 2050. A major factor for this increase is due to world population growth. Demographic projections have a high degree of certainty, thus the projections of future world food needs are based on population growth is quite reliable. Other major factor contributing to the increase is rising incomes of individuals, especially those in developing countries. Although the raising incomes of millions of people in the world have great benefits to them, it will also increase pressure on food requirements and demands on the world's agricultural resources. Increasing people's income is generated by world economic growth. However, long-term projections of future world economic growth are relatively uncertain. To base expected food needs on projections of future world economic growth has considerable uncertainty.

Malaysia is located in the Southeast Asia region and is one of the fastest developing countries in the world. United Nations have projected a dramatic urban growth for this region (Salih, 1982). The patterns of urbanization in Southeast Asia's top cities are expected to increase rapidly. The Malaysia population in 2014 is 30,267,367, a slight increase from 2013's estimation of 29,791,949. This population trend tremendously increases the demand of food. Moreover, the population in Malaysia is projected continue to grow linearly and is expected to reach approximately 43 million people by 2050.

Thus, in order to fulfil the demand of population increase, Malaysia remained a net importer of food in 2013 (RM15.6 billion). Major food imports include sugar & sugar confectionery (RM3.4 billion), dairy

products (RM3.2 billion), cereal and cereal preparations (RM1.5 billion), vegetable and fruits (RM1.2 billion) as well as cocoa and cocoa preparations (RM1.0 billion). Estimates by The UN's Food and Agriculture Organization (FAO), Malaysia's 2014/2015 (July- June) rice imports has increased to over 1.1 million tons which is above average level last to strong consumption, demand and government's

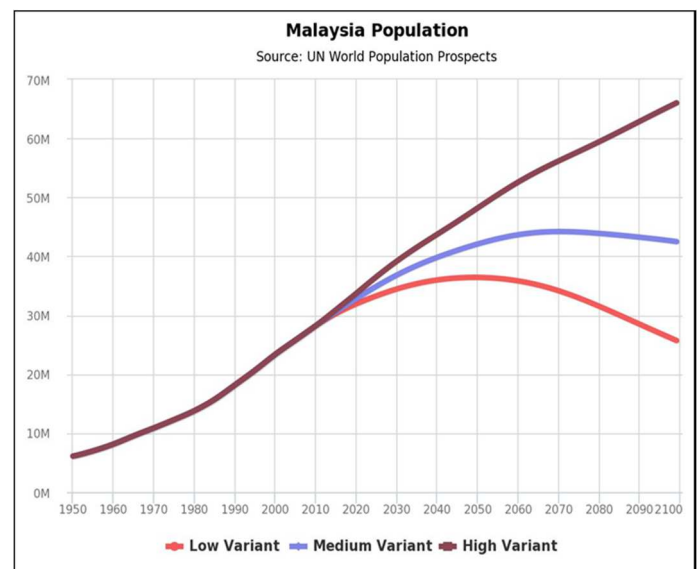


Figure 1: Malaysia Projected Population, 2005-2100  
Source: UNDESA (2012)

efforts to replenish stocks. In 2014, Malaysia's rice imports increased about 24% from their below average level in 2013.

It is also estimated that Malaysia's total cereal imports, including rice, to increase about 6% which is around 6.4 million from around 5.99 million tons last year. The FAO estimates Malaysia's 2015 paddy rice production at a record 2.6 million tons (around 1.69 million tons, basis milled), slightly above last year's production of about 2.5 million tons (around 1.62 million tons, basis milled) due to favourable weather conditions and continued government support to the rice sector, including subsidies for agricultural inputs. USDA estimates Malaysia to produce about 2.769 million tons of paddy (around 1.8 million tons, basis milled) and import around one million tons of rice in MY 2014/15 (January 2015- December 2015). Throwback from last year, *Bernas* has purchased rice from the latest 2014 off-season crop (January-July), harvested in July-August and maintained by private exporters. *Bernas* is planning to strike a government-to-government (G2G) deal with the Thai government to purchase another 200,000 tons. Malaysia was a traditional buyer of Thai rice but shifted to Vietnam over the past few years after the rice pledging scheme led to an illogical increase in Thai rice prices.

With the overview of rice trading, agriculture sector in Malaysia has been playing an important roles in the livelihood and economic development within the country. Over the last few years the agriculture sector has contributed significantly to gross domestic product (GDP) and it became the third engine of growth next to the manufacturing sector and service sector. For instance, this sector fundamentally consist of two category which is the co-existence plantation and smallholder's sub sectors. Then, it could later be classified into food and industrial commodities. The food sub sectors include paddy, vegetables, fruits, meats and fish while main industrial commodities are palm oil, rubber and cocoa. Agriculture's significant contribution towards the Malaysia economic growth can clearly be observed in the first few decades after Malaysia gain independence from the British colonial in 1957. Its significance role in funding Malaysia's economic activities in other sector because of high export returns on agriculture commodities such as palm oil and rubber. Nevertheless, in the early 1990s Malaysian government started to invest heavily in industrial sectors such as automobile, electrical and electronics as well as others due to the introduction of *Dasar Pandang ke Timur*. These sectors were believed to generate greater incomes and more significant impact on Malaysian economic growth. During a global financial crisis in 1997, Malaysian industrial sector faces severe downfall and affected most of the industries player. It is then that the agriculture sector later acted as a savior for the Malaysian economy as its contribution towards Gross Domestic Product (GDP) increased from RM 17.1 billion in 1995 to RM 18.2 billion in 2000 during the period of 8th Malaysia Plan. This in turn attracted government's attention to reemphasize on this sector. This has also impacted agricultural related courses in local universities such as agricultural sciences, biotechnology and agribusiness which started to gained big attention in order to produce more specialist and researchers in agricultural fields. This sector will continually act as an important field for government programs in poverty reduction. Furthermore, by revisiting this sector, the current stigma on agriculture activities which relate rural to poverty can be transform into a new paradigm which is a modern and commercially competitive sector with high returns to the GDP.

Through a different perspective, there was also less market protection for agriculture sector as it enjoyed very little in contrast to the manufacturing sector. Export taxes have been imposed on palm oil, rubber and pepper, leading to a decrease in agricultural production as

the result. On the other hand, trade protection for manufacturing sector enhances credit worthiness enabling manufacturing sector to obtain financing easily. While the manufacturing sector was enjoying such advantages it was not difficult to observe why there had been a persistent outflow of resources from agricultural sector to manufacturing sector, thus exploiting agricultural growth.

Malaysia has 4.06 million hectares of agricultural land distributed throughout 13 states. Since 1980s, one of the major challenges experienced by Malaysia's agriculture sector is land accessibility as agricultural land was taken over for industrial, infrastructural, and housing purposes. Agricultural land in Malaysia was last measured at 23.95% in 2009, according to the World Bank. Agricultural land refers to the share of land area that is arable, under permanent crops, and under permanent pastures. Arable land includes land defined by the Food and Agriculture Organisation, FAO (2014b) as land under temporary crops, temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. This terminology does not include abandoned land as a result of shifting cultivation. While land under permanent crops refers to land cultivated with crops that occupy such land for a long period and does not need to be replanted after each harvest, such as coconut, cocoa, coffee, and rubber. This category includes land planted with fruit trees, flowering shrubs, nut trees, and vines, but excludes land under trees grown for timber. Other terms is refer to permanent pasture which is land used for five or more years for forage, including natural and cultivated crops. From this point, it is clear that there are different uses of agricultural land recognised by global community as well as land administrator or planner in Malaysia. However, different definition from different perspective of planning and land administration is not an issue. What is more important is to understand the pressures that has been experienced by agricultural land for decades in Malaysia. According to Second National Physical Plan, agricultural areas have reduced over the years due to pressure from urban development (Table 1). More land, especially those adjacent to town, industries and housing areas are taken up for urban development. However, areas outside urban development zones should remain as agricultural areas, particularly those areas which are fertile or have special functions such as paddy land.

## 2. Materials and Methods

This study reviews literatures from various sources such as journals, reports, proceedings and related documents on assessment of food security status and land conversion phenomenon internationally as well as national level in Malaysia. Literatures were identified through a comprehensive search by using electronic and non-electronic databases. Several electronic databases (Science Direct, Springer, Wiley, and

*Table 1: Agricultural land use Peninsular Malaysia (Hectare)*

Crops	1997	2002	2006	Difference (06-02)
Paddy	410,000	405,800	331,036	-74,760
Palm Oil	2,174,500	2,466,500	2,816,513	350,013
Rubber	1,759,100	1,560,000	1,284,912	-275,088
Others	1,632,400	1,716,700	808,099	-908,601
Total	5,976,000	6,149,000	5,240,560	-908,441

Source: National Physical Plan 2 (2010)

Thomson Reuters) were searched for published literature in a systematic way using a range of key words relating to food security status, issues and challenges. Internet search engines were also used to find the related documents and reports published by the organizations undertaking research in this area. References cited in the literatures were searched and important studies were collected in full text. In addition, both electronic and non-electronic searches were also supplemented by a network of colleagues who provided related literatures and documents. In the review process, only the documents written in English were considered. This study reviewed the literatures that included discussions and demonstrated data, findings and evidences related to land use change that impacted the food security all over the world and tries to illustrate it in the context of Malaysia.

### 3. The Phenomenon of the Agricultural Land Conversion

FAO (2014a), generally, claimed that in most countries agriculture is the main user of land resources, thus it is one of the major driving forces in local as well as global environmental change. Conversion of agricultural land to other uses can have several environmental impacts on soil, water and biodiversity resources. A general decrease in agricultural areas has been observed in the last decades in urbanised countries as a consequence of growing demand for nature conservation areas, urban, industrial and infrastructural areas, amenity areas, and also as a consequence of land abandonment. Many non-agricultural activities resulted in land use change from agricultural land to artificial surfaces such as housing estate, transport infrastructure, urban sprawl, tourism and recreation facilities. That is why, increased land development often results in higher prices for land and has a significant impact on the environment and on agricultural landscapes.

For instance, land use change is related to socio-economic development and has huge impacts on environment through several changes of the usage of land. Therefore, land use change has become a key research area, especially since the International Geosphere and Biosphere Programme (IGBP) and the International Human Dimensions Programme on Global Environmental Change (IHDP) initiated their core project on land use and cover change in 1990s (Turner et al., 1995; Lambin et al., 1999; Li & Wang, 2003). Since land use change caused by land conversion which have been pressured the land, the phenomenon involve the changed of agricultural land use to non-agricultural land use, especially urban uses. There is a contradiction of ideas on whether agricultural land should be maintained or converted to other uses which involves both the pro-ruralist and the pro-urbanist perspectives. In the pro-ruralists view, land conversion has a negative impact which lead to the loss of prime agricultural land. Furthermore, it will indirectly reduced agricultural related jobs and unprofitable in term of investments. For instance, when the investor tries to provide irrigation infrastructure for particular crops such as paddy. As the result, it could affect agricultural production and threaten the food security. Pro-ruralists conclude that agricultural land should be kept to maintain food production. On the other hand, the pro-urbanists disagree and defend that land conversion is a rational consequences especially when there is urbanisation taking place. They argue that the decline of agricultural production can be solved by intensification and producing food technologically to enhance the quality and quantity of agricultural product. Hence, land conversion is not considered as a threat in their view.

In further discussion, some researchers apprehend land conversion as a phenomenon which is almost impossible to be avoided during economic

booms and population growth (Tan et al., 2009). However, generally, uncontrolled land conversion has great impacts on environment and particularly on agricultural products. Some countries such as USA, China and small country like Japan have tried to preserve agricultural land from being converted to other uses (Lichtenberg and Ding, 2008). Ho & Lin (2004) addressed that in China, since 1980, there is a rampant conversion of agricultural land to non-agricultural land due to high population density, rapid economic growth and urbanisation process as the main drivers. In 1995, agricultural land conversion accounted for more than two-third of the loss in cultivated land in several areas. Nevertheless, during 1996–2000, the rate of agricultural land conversion in The Netherlands was only 17 hectare per day while in Germany, the rate was 114 hectare per day in 2006. Such rates are much lower than in China and Indonesia which respectively experienced 802 in 2004 (Tan et al., 2009) and 514 hectare per day (2000–2002) (Agus & Irawan, 2006). The above description makes it clear that the rate of agricultural land conversion is different in developed and developing countries. Therefore, it is important to discover the main drivers of agricultural land conversion in different countries.

#### 3.1 Land Conversion Drivers lead to pressure on Agricultural Land

According to Setiawan & Purwanto (1994), there are two main drivers that contribute to agricultural land conversion which are internal and external (Table 2). The former drivers is related to the location and land potential (including land productivity), ownership pattern (including land size) and household size plus income. The latter includes urbanisation, socio-economic conditions and government policies.

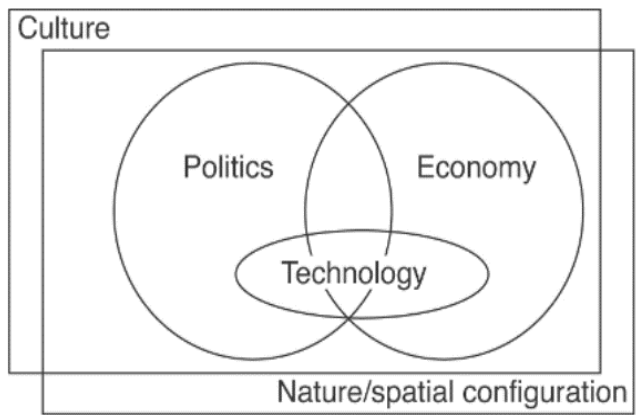
Other prominent researcher in agricultural land use change such as Hesperger & Bürgi (2007) has classified these driving forces into five groups. They are cultural, natural/spatial, political, economic and technological as shown in Figure 2.

Further discussion to understand the pressure on agricultural land by Hesperger found that political and economic driving forces are extremely inter-related since economic needs and pressures are reflected in political programs while economic instrument are used to implement political driving forces. Technological driving forces are discussed in the context of political and economic change of agricultural land. Besides that, the cultural driving forces set the societal framework while natural/spatial configurations drive the physical background for other driving forces. Rarely, modification of these two groups of driving

Table 2: List of two main drivers of Agricultural land conversion

Drivers	Forces by
<i>External</i>	Industrialization
	Urbanization
	Road infrastructure Development
	Government Policy
<i>Internal</i>	Land Productivity
	Technology Intensity

Source: Adapted from Setiawan & Purwanto (1994)



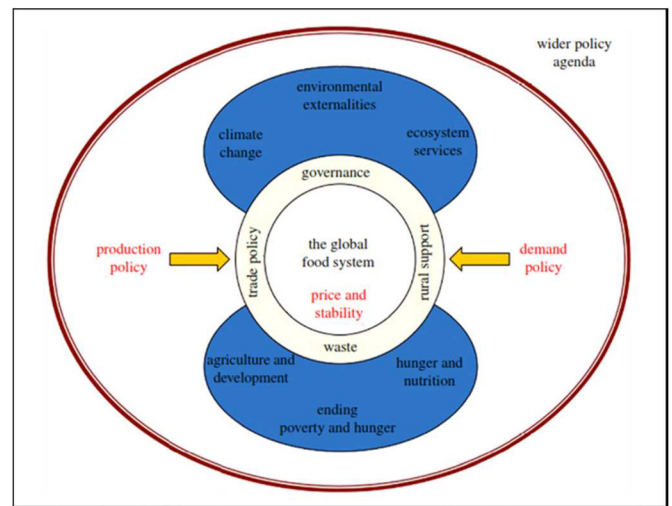
**Figure 2:** Conceptual framework of the five groups of driving forces  
 Source: Hesperger & Burgi (2007)

forces can be done by individual actors of landscape change such as planner and developer. The inter linkages and processes between each driving forces is very important for different stakeholders including researchers, land administrator and policy makers to create appropriate approaches that can preserve agricultural lands from being converted to other uses. Many countries have tried to preserve agricultural land from being converted to other uses (Lichtenberg & Ding, 2008), while others have been acting passively or introduce inappropriate plans to control the conversion. driving forces can be done by individual actors of landscape change such as planner and developer. The inter linkages and processes between each driving forces is very important for different stakeholders including researchers, land administrator and policy makers to create appropriate approaches that can preserve agricultural lands from being converted to other uses. Many countries have tried to preserve agricultural land from being converted to other uses (Lichtenberg & Ding, 2008), while others have been acting passively or introduce inappropriate plans to control the conversion.

#### 4. Food Security Concerns

Since conversion is driven by urbanisation as one of the major forces and pressure to agricultural land, undoubtedly it will affect a country's domestic food production. Looking at urban land expansion in broad perspectives, the total land taken up by major urban centres and cities is currently about 1% of the Earth's surface (UNDESA, 2014). Some forecasts suggest that the amount of land in cities could triple by 2030, but that still does not seem to be a large amount of land (Bai, 2012). As most cities are located in the most fertile land on our planet, urbanisation occurs in a very fertile agricultural land has a disproportionately high impact. Moreover, urbanisation is much more than just a demographic change; it change the quantities and structural mix of the demand for food, and it changed lifestyles, all of which have significant impacts on agriculture. There will be a very strong pressure on food production concentrated in vulnerable or heavily populated regions in the world, such as China, India and Africa. This is what most urbanist do not understand. When doing planning process, it does not only involve physical planning and transforming rural to urban, but they should put in mind the aspect of socio-economic development which is directly touch on food policy. This goal is thoughtlessly accepted by some and vigorously contested by others.

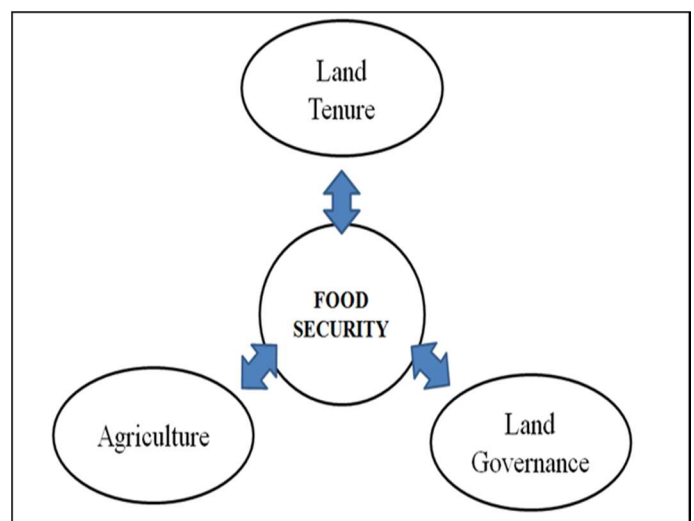
Generally, in order to understand further, at first place, the complexity of food policy (as shown in Figure 3) is comprising a production policy, price and stability plus the demand policy from the public. Policy decisions enacted on food production and demand has affect global food



**Figure 3:** The complexity of global food policy  
 Source: Godfray & Garnett (2014)

prices and their stability, however it still depends on numerous national and international policies on rural support mechanisms, international trade, the governance of the private sector and efforts to reduce waste. Decisions made about the global food system have profound effects on the environment and efforts to end poverty and hunger. Food policy itself is embedded within the wider policy landscape. Facing the challenge of global food security requires action on supply, demand and governance with it being critical to consider the effect of any policy action on the environment and the needs of the world's poorest.

Food security depends on food systems that deliver stable and appropriate access, availability and use of food. However, what makes a food system function satisfactorily is often difficult to understand as there are typically a range of biophysical, socioeconomic and political factors influencing a range of factors with interests across a range of levels on spatial and temporal scales. Achieving food security is emerging as one of the key development challenges for less developed country in the 21st century. For developed country, the challenge come in term of sustaining the food supply to achieve the demand of population. But curiously it seems to be neglected.



**Figure 4:** Major land Administration theme in Food Security Discussion  
 Source: Adopted from Rockson et al (2013)

Due to the effort of protecting agricultural land use from being effected by urbanisation and others pressures, the basis of land administration theme should also be discussed to understand more as what shown in Figure 4 above. Rockson et al. (2013) mentioned that land tenure security is one way to achieve food security. For example, Economic Commission for Africa (2004) describes over 70% of the population in Africa are linked to land and natural resources exploitation. Thus, both direct and indirect linkages exist between land tenure and food security – either through access to credit, or directly to farming the land. Access to land and security of tenure are the main means through which food security can be realized. Besides that, securing land tenure positively and negatively can affect food security. In countries where land administration inadequately protects the land rights of the citizen, food insecurity can be a consequence. In addition, access to land, power of citizen, and credit availability provided by secure land tenure can enhance food access and availability. Food security also has strong bonding with agricultural land since agricultural production relies on land and creates food (Barrett et al., 2009). Therefore, the government should give a massive attention and set up all possible resources towards development of a sustainable agricultural sector since the linkage between agriculture, land and food are interrelated. National land policies and regulation can help to determine how land can be developed. In nations with food insecurity, such linkages may need clearer articulation why land must be used for agricultural production, regulatory controls, and enforcement. In certain area such as African region and communist based economic countries, the rights of people to their lands and it use through appropriate land acts in a country is important to ensuring food security. For that, land governance cannot be neglected. At the first place, it ensures sustainable development of natural resources. A few contemporary researchers like Enemark et al. (2010) and Williamson et al. (2010) describe governance as having relation towards people and land. Both stressed that land governance is fundamental element in achieving sustainable development and at the same time alleviating poverty. Indeed, it will directly reduce hunger.

Since food is generally the largest expense category in the budget of the urban poor, it represents 60% or more of total expenditures. Some researcher address that the main source of food insecurity in most cases is food access (especially due to a lack of economic ), rather than food availability. But, according to MacLaren (2011), food availability in the future will depend on the availability of inputs (land, labour, capital, technology, water and the management skills of producers); the quality of these inputs; the efficiency of the distribution system, currently losing approximately one-third of production to spoilage; global warming; the demand for biofuels; and the economic signals given by markets and by governments to producers. There is growing awareness that, unless there are substantial developments in, and adoption of, new technologies in production and distribution, and improved economic signals to encourage adoption, the rate of growth of food production will continue to decline especially in the poor countries in which population growth is highest. Effective demand for food in the future will depend on population size and the level of per capita income. The world's population is forecasted to grow from 7 billion today to 9 billion by 2050. However, the effect of such an increase in population does not translate as a simple linear relationship into the required increase in food production. In other words, there is clear potential for food security to sustain the supply demand equilibrium in the future.

## 5. Sustaining the Significance of Agricultural Land for Future Needs

Agricultural land preservation or protection is refers to a approaches used to preserve or protect agricultural land for present and future agricultural use. These approaches have developed in effort to response to threats on agricultural land, such as urban development, the need for food security in a sustainable production system, and the desire to protect farmland for environmental and open space purposes. According to Beesley & Ramsey (2009), many approaches for agricultural land preservation is now in current practice. They are land use controls, incentive programs and integrated programs.

Incentive programs tend to try to encourage farmers to retain their land in agriculture through various tax incentives, introduce agricultural district, or the purchase or transfer of development rights. Land use control approaches include land use zoning, land banking, and right-to-farm legislation. Land use zoning for agricultural land preservation limits non-agricultural uses. While, land banks are usually a government initiatives to make agricultural land available to farmers at reasonable prices. So that, farmer can retain agricultural activities on particular land. Other tools is land trusts, set-asides, and easements which refer to the donation of development rights to a governmental or non-governmental organization, which normally in perpetuity. The implementation Right-to-farm legislations by the government can be observed as a legal tool that can protect farmers from nuisance lawsuits and allow the farmers to practice agriculture in a normal way.

Besides that, integrated approaches consist of land stewardship, multi-functionality and smart growth. Apparently, stewardship programs try to encourage and enable landowners and resource users to manage and protect land and natural resources with full of responsibility and accountability. Multi-functionality acknowledges that a particular resource base serves more than one purpose, for example, the economic, social, and environmental values of agriculture are recognised. Besides that, smart growth is an approach to urban growth management which focused on minimising low-density development in areas nearby to urban centres. That is why agricultural land preservation approaches require complementary agricultural support initiatives by stakeholders to be more effective. In mean time, their effectiveness needs to be monitored constantly. A combination of approaches perhaps a new comprehensive agricultural land preservation policy, will enhance the effectiveness and efficiency of agricultural land preservation initiatives economically. As the result, it will grant a better contribution to the potential of sustainable agriculture for sake of nation who continually demand for food as a part of living needs.

## 6. Conclusion

Since the land use change is now a trend that cannot be avoided, most developing countries especially Malaysia should be paying particular attention to factors that catalyze the process. Malaysia as an agriculture based country in past 1960s before the agricultural revolution came and the introduction of the New Economic Policy in 1971, government should think of an attempt to rescue agricultural land with more economic and returned to the agricultural sector in ensuring a stable supply of staple foods and to ensure future food security of the country. The process of urbanization and industrialization plus population growth, as expressed by many researchers became the main drivers of changes in land use since decades of millennium age. Due to that reason, it put a pressure on the availability of agricultural land for food production purposes. Although economic growth is inevitable and

upgrading of infrastructures are necessary to cope the needs of the future, but Malaysia should look forward to the fate of the next generation who will take over the Country so that they will not suffer the impact caused by past and current generation. The author believes desirable protected agricultural land use and further studies related mechanism must be intensified by all stakeholders especially academicians. This is one of the efforts to respond to the problems that could threaten the country's food security and lead to socio-economic shortcomings.

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